PB-239 573

LAKE WINNEBAGO, FOND DU LAC, AND CALUMET COUNTIES, WISCONSIN

Pacific Northwest Environmental Research Laboratory

Prepared for:

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Wisconsin National Guard
Wisconsin Department of Natural Resources

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16. ABSTRACT
Annual total phosphorus and total nitrogen loadings to the lake were estimated and subdivded according to either point or non-point source origin. An assessment of the lake's trophic condition and limiting nutrient is also provided. All data collected by the U.S.E.P.A. National Eutrophication Survey during the one year study of the lake and its tributaries are included in the report.

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REPORT

ON

LAKE WINNEBAGO

WINNEBAGO, FOND DU LAC, AND

CALUMET COUNTIES

WISCONSIN

EPA REGION V

WORKING PAPER No. 57

WITH THE COOPERATION OF THE

WISCONSIN DEPARTMENT OF NATURAL RESOURCES

AND THE

WISCONSIN NATIONAL GUARD

JANUARY, 1975

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FOREWORD

The National Eutrophication Survey was initiated in 1972 in response to an Administration commitment to investigate the nationwide threat of accelerated eutrophication to fresh water lakes and reservoirs.

OBJECTIVES

The Survey was designed to develop, in conjunction with state environmental agencies, information on nutrient sources, concentrations, and impact on selected freshwater lakes as a basis for formulating comprehensive and coordinated national, regional, and state management practices relating to point-source discharge reduction and non-point source pollution abatement in lake watersheds.

ANALYTIC APPROACH

The mathematical and statistical procedures selected for the Survey's eutrophication analysis are based on related concepts that:

a. A generalized representation or model relating sources, concentrations, and impacts can be constructed.

b. By applying measurements of relevant parameters associated with lake degradation, the generalized model can be transformed into an operational representation of a lake, its drainage basin, and related nutrients.

c. With such a transformation, an assessment of the potential for eutrophication control can be made.

LAKE ANALYSIS

In this report, the first stage of evaluation of lake and watershed data collected from the study lake and its drainage basin is documented. The report is formatted to provide state environmental agencies with specific information for basin planning [§303(e)], water quality criteria/standards review [§303(c)], clean lakes [§314(a,b)], and water quality monitoring [§106 and §305(b)] activities mandated by the Federal Water Pollution Control Act Amendments of 1972.

Beyond the single lake analysis, broader based correlations between nutrient concentrations (and loading) and trophic condition are being made to advance the rationale and data base for refinement of nutrient water quality criteria for the Nation's fresh water lakes. Likewise, multivariate evaluations for the relationships between land use, nutrient export, and trophic condition, by lake class or use, are being developed to assist in the formulation of planning guidelines and policies by EPA and to augment plans implementation by the states.

ACKNOWLEDGMENT

The staff of the National Eutrophication Survey (Office of Research & Development, U. S. Environmental Protection Agency) expresses sincere appreciation to the Wisconsin Department of Natural Resources for professional involvement and to the Wisconsin National Guard for conduct of the tributary sampling phase of the Survey.

Francis H. Schraufnagel, Acting Assistant Director, and Joseph R. Ball of the Bureau of Water Quality, and Donald R. Winter, Lake Rehabilitation Program, provided invaluable lake documentation and counsel during the Survey. Central Office and District Office personnel of the Department of Natural Resources reviewed the preliminary reports and provided critiques most useful in the preparation of this Working Paper series.

Major General James J. Lison, Jr., the Adjutant General of Wisconsin, and Project Officer CW-4 Donald D. Erickson, who directed the volunteer efforts of the Wisconsin National Guardsmen, are also gratefully acknowledged for their assistance to the Survey.

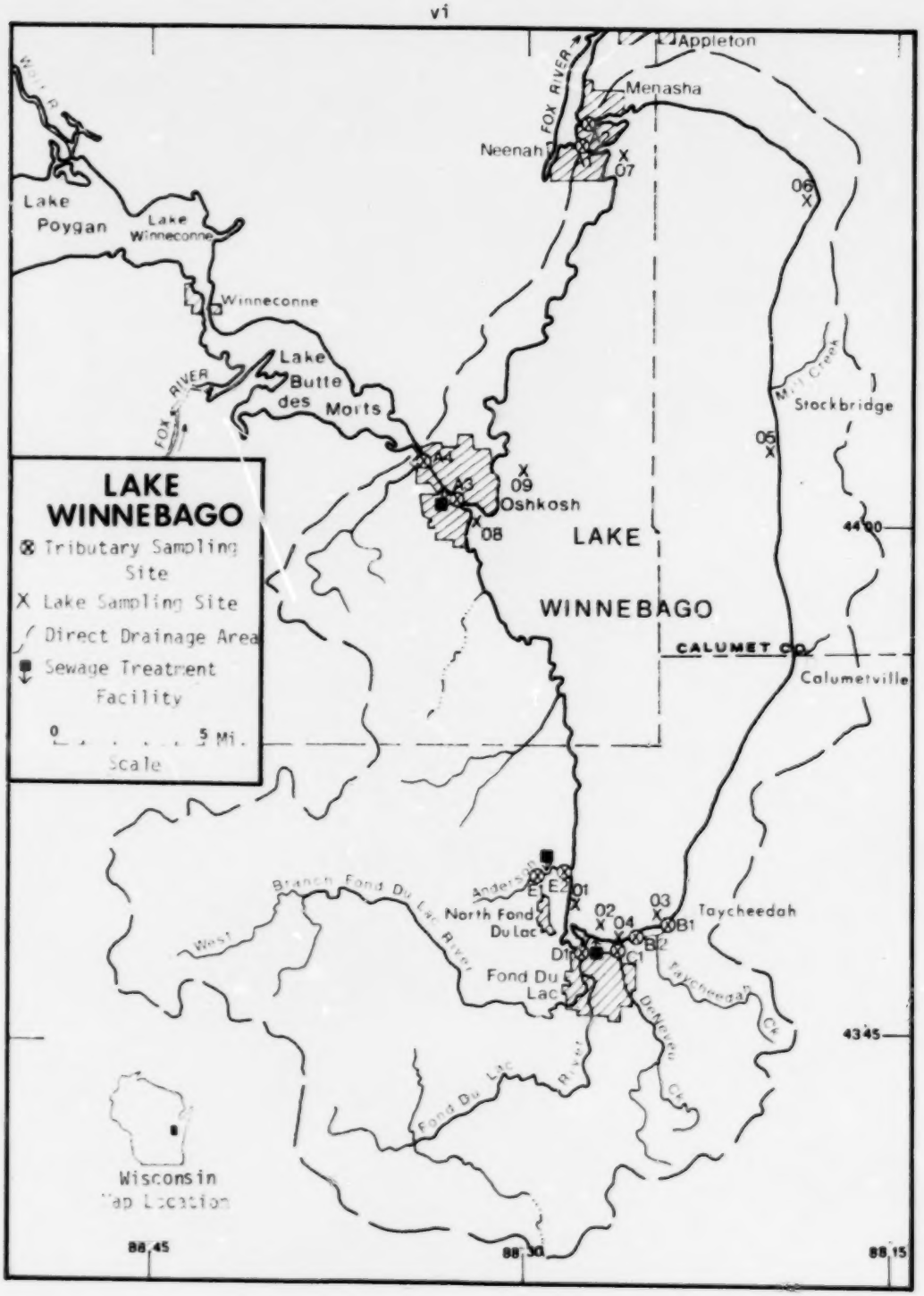
NATIONAL EUTROPHICATION SURVEY

STUDY LAKES

STATE OF WISCONSIN

LAKE NAME	COUNTY
Altoona	Eau Claire
Beaver Dam	Barron
Beaver Dam	Dodge
Big Eau Pleine	Marathon
Browns	Racine
Butte des Morts	Winnebago
Butternut	Price, Ashland
Castle Rock Flowage	Juneau
Como	Walworth
Crystal	Vilas
Delavan	Walworth
Eau Claire	Eau Claire
Geneva	Walworth
Grand	Green Lake
Green	Green Lake
Kegonsa	Dane
Koshkonong	Jefferson, Rock, Dane
Lac La Belle	Waukesha
Middle	Walworth
Nagawicka	Waukesha
Oconomowoc	Waukesha
Okauchee	Waukesha
Petenwell Flowage	Juneau
Pewaukee	Waukesha
Pigeon	Waupaca
Pine	Waukesha
Poygan	Winnebago, Waushara
Rock	Jefferson
Rome Pond	Jefferson, Waukesha
Round	Waupaca
Shawano	Shawano

LAKE NAME	COUNTY
Sinnissippi	Dodge
Swan	Columbia
Tainter	Dunn
Tichigan	Racine
Townline	Oneida
Trout	Vilas
Wapogassett	Polk
Wausau	Marathon
Willow	Oneida
Winnebago	Winnebago, Fond Du Lac, Calumet
Wisconsin	Columbia
Wissota	Chippewa
Yellow	Burnett


LAKE WINNEBAGO
Tributary Sampling Site
Lake Sampling Site
Direct Drainage Area
Sewage Treatment Facility
0 5 Mi.
Scale
Wisconsin
Map Location
Appleton
Menasha
Neenah
Lake Poygan
Lake Winneconne
Winneconne
Lake Butte des Morts
FOX RIVER
Stockbridge
Oshkosh
LAKE WINNEBAGO
CALUMET CO.
Calumetville
North Fond Du Lac
Fond Du Lac
Taycheedah
West Branch Fond Du Lac River
Fond Du Lac River
Taycheedah Cr.
Dotyville Cr.
Mill Creek
44 00
43 45
88 45
88 30
88 15

LAKE WINNEBAGO

STORET NO. 5554

I. CONCLUSIONS

A. Trophic Condition:

Survey data and the records of others show that Lake Winnebago is quite eutrophic.

B. Rate-Limiting Nutrient:

Algal assay results show that Lake Winnebago was nitrogen limited at the time the sample was collected. The lake data indicate nitrogen limitation at the other sampling times as well.

C. Nutrient Controllability:

1. Point sources--During the sampling year, Lake Winnebago received a total phosphorus load at a rate almost twice that proposed by Vollenweider (in press) as "dangerous"; i.e., a eutrophic rate (see page 16). Of this load, the point sources included in this study contributed about 21%. The two largest sources, the cities of Oshkosh and Fond du Lac, together contributed almost 20% of the total. The Wisconsin Department of Natural Resources has directed both cities to remove phosphorus, and construction was underway at the City of Oshkosh at the time of preparation of this report. It is noted that this action is primarily related to the effect of these sources on Lake Michigan.

It is concluded that phosphorus removal at the other point sources studied would not result in any significant improvement in the trophic state of Lake Winnebago, since collectively they only contribute about 1% of the total load.

2. Non-point sources (see page 15)--During the sampling year, the phosphorus exports of Lake Winnebago tributaries were quite high (mean of 153 lbs P/mi^2/yr) as compared to Wisconsin streams studied elsewhere in the Fox River basin; e.g., the mean P export of Green Lake tributaries was only 58 lbs/mi^2/yr (see "Report on Green Lake", Working Paper No. 39).

It is likely that the high exports are due in part to point sources outside of the Survey limits† in the Fox River drainage (Schraufnagle et al., 1967) as well as point sources in the Wolf River drainage (McKersie et al., 1971).

Assuming complete phosphorus removal at the point sources included in this study, it is calculated that the mean phosphorus export of Lake Winnebago tributaries would have to be reduced to 110 lbs/mi^2/yr to just equal a eutrophic loading rate, and it appears that a more detailed study is needed to assess the effectiveness of point-source phosphorus control elsewhere in the Lake Winnebago drainage system, including lakes Poygan* and Butte des Morts**.

† See Working Paper No. 1, "Survey Methods".
* Working Paper No. 45.
** Working Paper No. 35.

II. INTRODUCTION

Lake Winnebago is the largest lake in Wisconsin and, together with other water bodies in the Winnebago Pool, is one of the more important water resources in the State (Sloey and Blum, 1972). The cities of Oshkosh, Neenah, Appleton, and Menasha utilize the lake directly as a public water supply (Schraufnagel, 1974).

Recreational uses of the lake include swimming, boating, waterfowl hunting, and fishing; game fish present include northern pike, walleyes, sauger, white bass, and perch, and ice fishing for walleyes and sauger is said to be very popular during the winter (Weber, et al., 1969).

Public access to the lake is very good with over 20 miles of shoreline accessible. Boat launching and marinas are available.

III. LAKE AND DRAINAGE BASIN CHARACTERISTICS

A. Lake Morphometry†:

1. Surface area: 137,708 acres.
2. Mean depth: 13 feet.
3. Max. depth: 21 feet.
4. Volume: 1,790,204 acre/feet.
5. Mean hydraulic retention time: 210 days.

B. Tributary and Outlet:
(See Appendix A for flow data)

1. Tributaries -

Name	Drainage area*	Mean flow*
Fox River	5,580.0 mi^2	4,130.0 cfs
Taycheedah Creek	17.8 mi^2	6.4 cfs
De Neveu Creek	21.3 mi^2	7.8 cfs
Fond du Lac River	171.0 mi^2	70.0 cfs
Anderson Creek	7.9 mi^2	2.9 cfs
Minor tributaries & immediate drainage -	16.8 mi^2	100.3 cfs
Totals	5,814.8 mi^2	4,317.4 cfs

2. Outlet -

Fox River	6,030.0 mi^2**	4,317.4 cfs**

C. Precipitation***:

1. Year of sampling: 36.1 inches.
2. Mean annual: 28.9 inches.

† Ball, 1973.
* Drainage areas are accurate within ±0.5%; mean daily flows are accurate within ±40%; mean monthly flows are accurate within ±35%; and normalized monthly flows are accurate within ±35%.
** Includes area of the lake; outflow adjusted to equal sum of inflows.
*** See Working Paper No. 1, "Survey Methods".

IV. LAKE WATER QUALITY SUMMARY

Lake Winnebago was sampled three times during the open-water season of 1972 by means of a pontoon-equipped Huey helicopter. Samples for physical and chemical parameters were collected from one or more depths at seven stations in June and nine in August and November (see map, page vi). During each visit, a single depth-integrated (near bottom to surface) sample was composited from the stations for phytoplankton identification and enumeration; and during the last visit, two five-gallon depth-integrated samples were collected for algal assays. Also each time, a depth-integrated sample was collected from each of the stations for chlorophyll a analysis. The maximum depths sampled were 4 feet at stations 1, 2, 3, and 4; 8 feet at stations 5 and 8; 12 feet at station 6; 6 feet at station 7; and 15 feet at station 9.

The results obtained are presented in full in Appendix B, and the data for the fall sampling period, when the lake essentially was well-mixed, are summarized below. Note, however, the Secchi disc summary is based on all values.

For differences in the various parameters at the other sampling times, refer to Appendix B.

A. Physical and chemical characteristics:

Parameter	Minimum	Mean	Median	Maximum
		FALL VALUES (11/09/72)		
Temperature (Cent.)	6.0	6.4	6.1	7.0
Dissolved oxygen (mg/l)	9.3	10.7	10.8	11.5
Conductivity (μmhos)	300	357	325	590
pH (units)	7.8	8.0	7.9	8.3
Alkalinity (mg/l)	131	148	139	216
Total P (mg/l)	0.055	0.089	0.087	0.134
Dissolved P (mg/l)	0.030	0.053	0.047	0.096
NO_2 + NO_3 (mg/l)	0.140	0.327	0.240	1.030
Ammonia (mg/l)	0.280	0.502	0.395	1.330
		ALL VALUES		
Secchi disc (inches)	12	22	19	44

B. Biological characteristics:

1. Phytoplankton -

Sampling Date	Dominant Genera	Number per ml
06/24/72	1. Anabaena	5,317
	2. Melosira	1,329
	3. Cyclotella	725
	4. Dactylococcopsis	362
	5. Dinobryon	212
	Other genera	816
	Total	8,761
08/20/72	1. Anabaena	5,072
	2. Melosira	1,667
	3. Stephanodiscus	254
	4. Dactylococcopsis	217
	5. Synedra	109
	Other genera	543
	Total	7,862
11/09/72	1. Melosira	2,712
	2. Cyclotella	452
	3. Dinobryon	127
	4. Microcystis	108
	5. Lyngbya	90
	Other genera	435
	Total	3,924

2. Chlorophyll *a* -
(Because of instrumentation problems during the 1972 sampling, the following values may be in error by plus or minus 20 percent.)

Sampling Date	Station Number	Chlorophyll *a* (µg/l)
06/24/72	01	133.9
	02	119.2
	03	59.8
	04	75.2
	05	26.8
	06	50.8
	07	151.1
	08	-
	09	-
08/20/72	01	8.8
	02	2.7
	03	50.6
	04	50.9
	05	22.6
	06	16.8
	07	61.1
	08	23.6
	09	7.4
11/09/72	01	24.3
	02	9.6
	03	43.8
	04	25.9
	05	52.0
	06	35.7
	07	18.8
	08	22.3
	09	25.0

C. Limiting Nutrient Study:

1. Autoclaved, filtered, and nutrient spiked -

a. Stations 1, 2, 3, 4, and 5 -

Spike (mg/l)	Ortho P Conc. (mg/l)	Inorganic N Conc. (mg/l)	Maximum yield (mg/l-dry wt.)
Control	0.054	0.730	17.5
0.006 P	0.060	0.730	18.8
0.012 P	0.066	0.730	18.9
0.024 P	0.078	0.730	18.8
0.060 P	0.114	0.730	20.1
0.060 P + 10.0 N	0.114	10.730	56.7
10.0 N	0.054	10.730	24.8

b. Stations 6, 7, 8, and 9 -

Spike (mg/l)	Ortho P Conc. (mg/l)	Inorganic N Conc. (mg/l)	Maximum yield (mg/l-dry wt.)
Control	0.033	0.330	9.3
0.006 P	0.039	0.330	8.9
0.012 P	0.045	0.330	9.7
0.024 P	0.057	0.330	9.2
0.060 P	0.093	0.330	9.5
0.060 P + 10.0 N	0.093	10.330	47.4
10.0 N	0.033	10.330	13.1

2. Discussion -

Two samples were collected during the November sampling period to determine the limiting nutrient for Lake Winnebago. Sites 1, 2, 3, 4, and 5 were combined for one assay, and sites 6, 7, 8, and 9 were combined for the other.

Both assays showed similar results, although a higher yield of the assay alga, Selenastrum capricornutum, was observed for the sample composited from sites 1, 2, 3, 4, and 5. Nutrient levels in the lake showed differences that corresponded with the differences observed in the assay control yields.

In both assays, the lack of significant response to increased levels of orthophosphorus until nitrogen was also added indicates Lake Winnebago was nitrogen limited at the time the samples were collected (note the significant yield increase when only nitrogen was added). The lake data indicate nitrogen limitation at the other sampling times as well (N/P ratios were less than 3/1).

D. Trophic Condition:

The morphometry of Lake Winnebago is such that this lake would probably be considered eutrophic even in the absence of cultural influences. Since "Winnebago" is an Indian name meaning "stinking or smelly water" (Marx, 1951), it appears the lake has been eutrophic for a long time.

The lake is considered to be one of the most eutrophic water bodies in Wisconsin (Lueschow, et al., 1970). Survey limnologists noted algal blooms in June and August of 1972, and observed heavy growths of aquatic vegetation in much of the littoral zone of the lake.

Of the 46 Wisconsin lakes studied in the Survey, 37 had less mean total phosphorus, 28 had less mean inorganic nitrogen, 41 had greater Secchi disc transparencies, 41 had less mean chlorophyll a, and 34 had less algal assay control yield.

V. NUTRIENT LOADINGS
(See Appendix C for data)

For the determination of nutrient loadings, the Wisconsin National Guard collected monthly near-surface grab samples from each of the tributary sites indicated on the map (page vi), except for the high runoff months of April and May when two samples were collected. Sampling was begun in September, 1972, and was completed in August, 1973.

Through an interagency agreement, stream flow estimates for the year of sampling and a "normalized" or average year were provided by the Wisconsin District Office of the U.S. Geological Survey for the tributary sites nearest the lake. The outlet flows were recorded at Rapide Roche Dam on the Fox River downstream from the outlet but are considered to be representative of the actual discharge from Lake Winnebago.

In this report, nutrient loads for sampled tributaries were calculated from mean concentrations and mean flows; however, the Fox River inlet loads at station A-4 are those measured as outlet loads of Lake Butte des Morts*. The Fox River outlet and the Taycheedah Creek inlet have two channels; in both cases nutrient samples were collected from each channel. Nutrient loadings for these streams were based on the mean concentrations of nutrients in both channels and the mean flows.

Nutrient loadings for unsampled "minor tributaries and immediate drainage" ("ZZ" of U.S.G.S.) were estimated by using the mean concentrations in Taycheedah Creek at stations B-1 and B-2 and the mean ZZ flow.

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* Working Paper No. 35.

The operators of the Fond du Lac, North Fond du Lac, and Oshkosh wastewater treatment plants provided monthly effluent samples and corresponding flow data. The effluents of the Village of Stockbridge and the Wisconsin Home for Women at Taycheedah were not sampled, and nutrient loads were estimated at 2.5 lbs P and 7.5 lbs N/capita/year.

A. Waste Sources†:

1. Known municipal -

Name	Pop.* Served	Treatment	Mean Flow (mgd)	Receiving Water
Fond du Lac	35,515	Trickling filter	7.100	Lake Winnebago
N. Fond du Lac	3,286	Trickling filter	0.605	Anderson Creek
Oshkosh	53,221	Primary	11.405	Fox River
Stock-bridge	475	Act. sludge	0.048**	Mud Creek
Wisc. Home for Women, Taycheedah	600	Trickling filter	0.060**	drain to lake

2. Industrial - Unknown

† Schraufnagel, et al., 1967.
* 1970 Census.
** Flows estimated at 100 gal/capita/day.

B. Annual Total Phosphorus Loading - Average Year:

1. Inputs -

Source	lbs P/ yr	% of total
a. Tributaries (non-point load) -		
Fox River	811,270	70.5
Taycheedah Creek	2,510	0.2
De Neveu Creek	2,740	0.2
Fond du Lac River	31,290	2.7
Anderson Creek	1,330	0.1
b. Minor tributaries & immediate drainage (non-point load) -	39,490	3.4
c. Known municipal STP's -		
Oshkosh	89,060	7.7
North Fond du Lac	9,240	0.8
Fond du Lac	138,030	12.0
Stockbridge	1,190	0.1
Wisc. Home for Women	1,500	0.1
d. Septic tanks* -	830	<0.1
e. Industrial - Unknown	?	-
f. Direct precipitation** -	21,480	1.9
Total	1,149,960	100.0

2. Outputs -

Lake outlet - Fox River 1,198,410

3. Net annual P loss - 48,450 pounds

* Estimated 1,327 lakeshore dwellings; see Working Paper No. 1.
** See Working Paper No. 1.

C. Annual Total Nitrogen Loading - Average Year:

1. Inputs -

Source	lbs N/ yr	% of total
a. Tributaries (non-point load) -		
Fox River	14,404,140	78.0
Taycheedah Creek	48,680	0.3
De Neveu Creek	48,310	0.3
Fond du Lac River	442,340	2.4
Anderson Creek	14,400	0.1
b. Minor tributaries & immediate drainage (non-point load) -	765,330	4.1
c. Known municipal STP's -		
Oshkosh	489,990	2.7
North Fond du Lac	32,730	0.2
Fond du Lac	863,620	4.7
Stockbridge	3,560	<0.1
Wisc. Home for Women	4,500	<0.1
d. Septic tanks* -	12,470	0.1
e. Industrial - Unknown	?	-
f. Direct precipitation** -	1,326,680	7.2
Total	18,456,750	100.0

2. Outputs -

Lake outlet - Fox River 15,256,340

3. Net annual N accumulation - 3,200,410 pounds

* Estimated 1,327 lakeshore dwellings; see Working Paper No. 1.
** See Working Paper No. 1.

D. Mean Annual Non-point Nutrient Export by Subdrainage Area:

Tributary	lbs P/mi^2/yr	lbs N/mi^2/yr
Fox River	145	2,581
Taycheedah Creek	141	2,735
De Neveu Creek	129	2,268
Fond du Lac River	183	2,587
Anderson Creek	168	1,823

E. Yearly Loading Rates:

In the following table, the existing phosphorus loading rates are compared to those proposed by Vollenweider (in press). Essentially, his "dangerous" rate is the rate at which the receiving water would become eutrophic or remain eutrophic; his "permissible" rate is that which would result in the receiving water remaining oligotrophic or becoming oligotrophic if morphometry permitted. A mesotrophic rate would be considered one between "dangerous" and "permissible".

Note that Vollenweider's model may not be applicable to water bodies with very short retention times.

	Total Phosphorus		Total Nitrogen	
Units	Total	Accumulated	Total	Accumulated
lbs/acre/yr	8.4	loss*	134.0	23.2
grams/m^2/yr	0.94	-	15.0	2.6

Vollenweider loading rates for phosphorus ($g/m^2/yr$) based on mean depth and mean hydraulic retention time of Lake Winnebago:

"Dangerous" (eutrophic rate)	0.52
"Permissible" (oligotrophic rate)	0.26

* There was an apparent loss of phosphorus during the sampling year. This may have been due to unmeasured point sources discharging directly to the lake or to unsampled tributaries, or it may have resulted from the intermittant back-flushing from Lake Winnebago to Lake Butte des Morts known to occur during periods of east winds (Sloey, 1970). Also, the loss was quite small (4%) and could well have been due to the limits of accuracy of the flow estimates provided by U.S.G.S. (see page 3).

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VII. APPENDICES

APPENDIX A

TRIBUTARY FLOW DATA

TRIBUTARY FLOW INFORMATION FOR WISCONSIN 9/30/74

LAKE CODE 5554 LAKE WINNEBAGO

TOTAL DRAINAGE AREA OF LAKE 6030.00

TRIBUTARY	SUB-DRAINAGE AREA	NORMALIZED FLOWS JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	MEAN
5554A1	6030.00	3800.00	4000.00	4800.00	6900.00	6000.00	5300.00	4000.00	2700.00	2600.00	3000.00	3300.00	3600.00	4164.11
5554A4	5580.00	2281.0	2479.5	4463.1	10910.0	6545.9	5256.5	2975.4	2578.6	2876.2	2976.2	3372.1	2876.2	4130.0
5554B1	17.83	1.50	1.60	40.00	17.00	3.60	5.90	1.60	1.20	0.60	0.80	1.40	0.90	6.38
5554C1	21.30	1.80	2.00	48.00	21.00	4.60	7.40	1.90	1.50	0.80	1.00	1.70	1.20	7.79
5554D1	171.00	29.00	31.00	260.00	210.00	70.00	110.00	30.00	24.00	12.00	17.00	28.00	18.00	70.02
5554E2	7.92	0.50	0.60	21.00	6.90	1.30	2.00	0.50	0.40	0.20	0.30	0.50	0.30	2.90
5554ZZ	232.00	44.00	47.00	340.00	300.00	100.00	170.00	54.00	34.00	18.00	25.00	42.00	28.00	100.25

SUMMARY

TOTAL DRAINAGE AREA OF LAKE = 6030.00
SUM OF SUB-DRAINAGE AREAS = 6030.04
TOTAL FLOW IN = 51835.14
TOTAL FLOW OUT = 50000.00

MEAN MONTHLY FLOWS AND DAILY FLOWS

TRIBUTARY	MONTH	YEAR	MEAN FLOW	DAY	FLOW	DAY	FLOW	DAY	FLOW
5554A1	9	72	6900.00	23	6500.00				
	10	72	7200.00	21	7000.00				
	11	72	7500.00	18	8100.00				
	12	72	2800.00	23	3800.00				
	1	73	6300.00						
	2	73	7700.00	24	6700.00				
	3	73	12400.00	24	15000.00				
	4	73	13000.00	7	14000.00	21	11000.00		
	5	73	15000.00	5	15000.00	19	16000.00		
	6	73	9100.00	23	4200.00				
	7	73	3100.00	21	1900.00				
	8	73	2300.00	25	2100.00				
5554A4	9	72	5400.00	23	4200.00				
	10	72	7400.00	15	6700.00				
	11	72	6800.00	12	6800.00				
	12	72	4200.00	10	4000.00				
	1	73	5200.00						
	2	73	4300.00	11	5600.00				
	3	73	15000.00	11	18000.00				
	4	73	14000.00	1	16000.00	14	12000.00		
	5	73	18000.00	6	19000.00	20	16000.00		
	6	73	10000.00	26	6500.00				
	7	73	3400.00	14	3200.00				
	8	73	2600.00	11	2900.00				

TRIBUTARY FLOW INFORMATION FOR WISCONSIN 9/30/74

LAKE CODE 5554 LAKE WINNEBAGO

MEAN MONTHLY FLOWS AND DAILY FLOWS

TRIBUTARY	MONTH	YEAR	MEAN FLOW	DAY	FLOW	DAY	FLOW	DAY	FLOW
5554A1	9	72	14.00	23	24.00				
	10	72	18.00	1	27.00				
	11	72	13.00						
	12	72	4.50	2	5.10				
	1	73	45.00						
	2	73	53.00	11	71.00				
	3	73	100.00	3	92.00				
	4	73	29.00	7	23.00	23	44.00		
	5	73	17.00	6	22.00	20	14.00		
	6	73	7.60	17	5.40				
	7	73	1.00	8	1.10				
	8	73	0.80	4	0.70				
5554C1	9	72	11.00	23	18.00				
	10	72	13.00	1	21.00				
	11	72	10.00						
	12	72	3.40	2	3.90				
	1	73	53.00						
	2	73	61.00	11	82.00				
	3	73	120.00	3	110.00				
	4	73	36.00	7	28.00	23	53.00		
	5	73	22.00	6	28.00	19	19.00		
	6	73	9.60	17	6.80				
	7	73	1.30	8	1.40				
	8	73	1.00	4	0.80				
5554D1	9	72	190.00	23	330.00				
	10	72	240.00	1	380.00				
	11	72	180.00						
	12	72	63.00	2	72.00				
	1	73	300.00						
	2	73	340.00	11	460.00				
	3	73	660.00	3	600.00				
	4	73	370.00	7	290.00	23	540.00		
	5	73	340.00	6	440.00	19	290.00		
	6	73	150.00	17	110.00				
	7	73	20.00	8	21.00				
	8	73	16.00	4	13.00				
5554E2	9	72	0.30	23	0.50				
	10	72	0.40	1	0.60				
	11	72	0.38						
	12	72	0.10	2	0.10				
	1	73	24.00						
	2	73	27.00	11	36.00				
	3	73	53.00	3	48.00				
	4	73	12.00	7	9.50	23	18.00		
	5	73	5.80	6	7.80	19	4.80		
	6	73	2.60	17	1.90				
	7	73	0.40	8	0.40				
	8	73	0.30	4	0.20				

TRIBUTARY FLOW INFORMATION FOR WISCONSIN 9/30/74

LAKE CODE 5554 LAKE WINNEBAGO

MEAN MONTHLY FLOWS AND DAILY FLOWS

TRIBUTARY	MONTH	YEAR	MEAN FLOW	DAY	FLOW	DAY	FLOW	DAY	FLOW
5554ZZ	9	72	270.00	23	470.00				
	10	72	330.00	1	540.00	15	260.00	21	160.00
	11	72	260.00	12	310.00	18	260.00		
	12	72	88.00	2	100.00	10	70.00	23	88.00
	1	73	340.00						
	2	73	440.00	11	600.00				
	3	73	840.00	3	790.00				
	4	73	500.00	7	400.00	23	760.00		
	5	73	500.00	6	640.00	19	420.00	20	400.00
	6	73	220.00	17	160.00				
	7	73	30.00	8	31.00				
	8	73	23.00	4	19.00				

APPENDIX B

PHYSICAL and CHEMICAL DATA

STORET RETRIEVAL DATE 74/09/30

555401
43 49 00.0 088 28 00.0
LAKE WINNEBAGO
55 WISCONSIN

11EPALES 2111202
5 0004 FEET DEPTH

DATE FROM TO	TIME OF DAY	DEPTH FEET	00010 WATER TEMP CENT	00300 DO MG/L	00077 TRANSP SECCHI INCHES	00094 CNDUCTVY FIELD MICROMHO	00400 PH SU	00410 T ALK CACO3 MG/L	00630 NO2&NO3 N-TOTAL MG/L	00610 NH3-N TOTAL MG/L	00665 PHOS-TOT MG/L P	00666 PHOS-DIS MG/L P
72/06/24	14 20	0000	16.0	12.7	18	290	8.21	140	0.050	0.060	0.065	0.039
72/08/20	14 35	0000			32	315	8.68	112	0.160	0.080	0.142	0.082
	14 35	0004	22.7	6.1		305	8.65	111	0.110	0.070	0.168	0.082
72/11/09	10 00	0000	7.0	10.8	20	380	7.80	142	0.330	0.300	0.118	0.080

DATE FROM TO	TIME OF DAY	DEPTH FEET	32217 CHLRPHYL A UG/L
72/06/24	14 20	0000	133.9J
72/08/20	14 35	0000	8.8J
72/11/09	10 00	0000	24.3J

J VALUE KNOWN TO BE +/- ERROR

STORET RETRIEVAL DATE 74/09/30

555402
43 48 30.0 088 27 00.0
LAKE WINNEBAGO
55 WISCONSIN

11EPALES
5

2111202
0000 FEET DEPTH

DATE FROM TO	TIME OF DAY	DEPTH FEET	00010 WATER TEMP CENT	00300 DO MG/L	00077 TRANSP SECCHI INCHES	00094 CNDUCTVY FIELD MICROMHO	00400 PH SU	00410 T ALK CACO3 MG/L	00630 NO2&NO3 N-TOTAL MG/L	00610 NH3-N TOTAL MG/L	00665 PHOS-TOT MG/L P	00666 PHOS-DIS MG/L P
72/06/24	14 40	0000	16.4	15.6		305	8.10	143	0.150	0.110	0.277	0.108
72/08/20	14 14	0000			16	350	8.70	124	0.510	0.160	0.301	0.209
	14 14	0004	22.9	4.1		510	7.30	163	1.080	1.220	0.944	0.728
72/11/09	10 20	0000	7.0	10.4	17	590	8.00	216	1.030	0.300	0.134	0.096

DATE FROM TO	TIME OF DAY	DEPTH FEET	32217 CHLRPHYL A UG/L
72/06/24	14 40	0000	119.2J
72/08/20	14 14	0000	2.7J
72/11/09	10 20	0000	9.6J

J VALUE KNOWN TO BE IN ERROR

STORET RETRIEVAL DATE 74/09/30

555403
43 48 30.0 088 24 30.0
LAKE #INNEBAGO
55 #ISCONSIN

11EPALES
5

2111202
0004 FEET DEPTH

DATE FROM TO	TIME OF DAY	DEPTH FEET	00010 WATER TEMP CENT	00300 DO MG/L	00077 TRANSP SECCHI INCHES	00094 CNDUCTVY FIELD MICROMHO	00400 PH SU	00410 T ALK CACO3 MG/L	00630 NO2&NO3 N-TOTAL MG/L	00610 NH3-N TOTAL MG/L	00665 PHOS-TOT MG/L P	00666 PHOS-DIS MG/L P
72/06/24	15 00	0000	16.8	9.6	20	305	7.20	141	0.240	0.080	0.122	0.109
72/08/20	11 35	0000			19	278	8.40	112	0.270	0.140	0.167	0.050
	11 35	0004	21.2	4.8		300	8.30	122	0.420	0.150	0.173	0.074
72/11/09	10 35	0000	7.0	11.0	17	380	8.20	154	0.440	0.220	0.105	0.060

DATE FROM TO	TIME OF DAY	DEPTH FEET	32217 CHLRPHYL A UG/L
72/06/24	15 00	0000	59.8J
72/08/20	11 35	0000	50.6J
72/11/09	10 35	0000	43.8J

J VALUE KNOWN TO BE IN ERROR

STORET RETRIEVAL DATE 74/09/30

555404
43 47 24.0 088 26 00.0
LAKE WINNEBAGO
55 WISCONSIN

11EPALES
3

2111202
0002 FEET DEPTH

DATE FROM TO	TIME OF DAY	DEPTH FEET	00010 WATER TEMP CENT	00300 DO MG/L	00077 TRANSP SECCHI INCHES	00094 CNDUCTVY FIELD MICROMHO	00400 PH SU	00410 T ALK CACO3 MG/L	00630 NO2&NO3 N-TOTAL MG/L	00610 NH3-N TOTAL MG/L	00665 PHOS-TOT MG/L P	00666 PHOS-DIS MG/L P
72/06/24	15 25	0000	17.0	12.4		300	7.83	149	0.120	0.060	0.220	0.075
72/08/20	12 00	0000			19	340	8.45	130	0.400	0.230	0.231	0.167
	12 00	0004	22.4	6.5		325	8.45	134	0.440	0.210	0.274	0.179
72/11/09	10 25	0000	7.0	11.2	18	460	8.20	190	0.720	0.200	0.115	0.074

DATE FROM TO	TIME OF DAY	DEPTH FEET	32217 CHLRPHYL A UG/L
72/06/24	15 25	0000	75.2J
72/08/20	12 00	0000	50.9J
72/11/09	10 25	0000	25.9J

J VALU KNOWN TO BE IN ERROR

STORET RETRIEVAL DATE 74/09/30

555405
44 03 00.0 088 19 36.0
LAKE WINNEBAGO
55 WISCONSIN

11EPALES 2111202
3 0010 FEET DEPTH

DATE FROM TO	TIME OF DAY	DEPTH FEET	00010 WATER TEMP CENT	00300 DO MG/L	00077 TRANSP SECCHI INCHES	00094 CNDUCTVY FIELD MICROMHO	00400 PH SU	00410 T ALK CACO3 MG/L	00630 NO2&NO3 N-TOTAL MG/L	00610 NH3-N TOTAL MG/L	00665 PHOS-TOT MG/L P	00666 PHOS-DIS MG/L P
72/06/24	17	10 0000	19.3	15.2	12	300	8.80	140	0.060	0.100	0.154	0.112
	17	10 0010	17.2	10.6		305	8.53	142	0.060	0.080	0.109	0.079
72/08/20	11	00 0000			40	258	9.05	119	0.080	0.030	0.157	0.092
	11	00 0004	22.4	10.5		250	9.05	119	0.090	0.050	0.179	0.107
	11	00 0008	22.2	9.0		255	8.98	119	0.080	0.040	0.182	0.100
72/11/09	10	55 0000			18	340	8.30	136	0.240	0.130	0.073	0.044
	10	55 0006	6.0	11.5		330	8.30	137	0.240	0.130	0.080	0.043

DATE FROM TO	TIME OF DAY	DEPTH FEET	32217 CHLRPHYL A UG/L
72/06/24	17	10 0000	36.8J
72/08/20	11	00 0000	22.6J
72/11/09	10	55 0000	52.0J

J VALUE ENTERED IS AN ESTIMATED

STORET RETRIEVAL DATE 74/09/30

555406
44 10 00.0 088 18 00.0
LAKE WINNEBAGO
55 WISCONSIN

11EPALES
5

2111202
0007 FEET DEPTH

DATE FROM TO	TIME OF DAY	DEPTH FEET	00010 WATER TEMP CENT	00300 DO MG/L	00077 TRANSP SECCHI INCHES	00094 CNDUCTVY FIELD MICROMHO	00400 PH SU	00410 T ALK CACO3 MG/L	00630 NO2&NO3 N-TOTAL MG/L	00610 NH3-N TOTAL MG/L	00665 PHOS-TOT MG/L P	00666 PHOS-DIS MG/L P
72/06/24	17 50	0000	18.7	16.1	18	290	9.00	188	0.190	0.070	0.067	0.043
72/09/20	10 35	0000			43	260	8.90	123	0.070	0.030	0.180	0.139
	10 35	0004	22.0	8.7		258	8.90	121	0.060	0.020	0.175	0.130
72/11/09	11 00	0000			23	320	8.10	135	0.150	0.130	0.087	0.045
	11 00	0004	6.1	11.0		320	8.00	135	0.160	0.160	0.089	0.047
	11 00	0012	6.1	10.8		320	8.00	134	0.140	0.150	0.089	0.045

DATE FROM TO	TIME OF DAY	DEPTH FEET	32217 CHLRPHYL A UG/L
72/06/24	17 50	0000	50.8J
72/09/20	10 35	0000	16.8J
72/11/09	11 00	0000	35.7J

J VALUE ESTIMATED TO BE LESS THAN

STORET RETRIEVAL DATE 74/09/10

555407
44 11 00.0 088 26 00.0
LAKE WINNEBAGO
55 WISCONSIN

11EPALES 2111202
5 0011 FEET DEPTH

DATE FROM TO	TIME OF DAY	DEPTH FEET	00010 WATER TEMP CENT	00300 DO MG/L	00077 TRANSP SECCHI INCHES	00094 CNDUCTVY FIELD MICROMHO	00400 PH SU	00410 T ALK CACO3 MG/L	00630 NO2&NO3 N-TOTAL MG/L	00610 NH3-N TOTAL MG/L	00665 PHOS-TOT MG/L P	00666 PHOS-DIS MG/L P
72/06/24	18 25	0000	19.0	15.4	20	280	9.00	130	0.060	0.090	0.287	0.137
	18 25	0010	17.7	9.8		280	8.70	133	0.050	0.080	0.054	0.030
72/09/20	08 20	0000			18	258	9.10	119	0.090	0.060	0.253	0.143
	08 20	0006	23.8	9.6		260	9.05	121	0.120	0.070	0.234	0.132
72/11/09	10 45	0000			24	300	7.90	132	0.150	0.200	0.089	0.055
	10 45	0006	6.0	10.9		300	7.90	131	0.170	0.210	0.096	0.061

DATE FROM TO	TIME OF DAY	DEPTH FEET	32217 CHLRPHYL A UG/L
72/06/24	18 25	0000	151.1J
72/08/20	08 20	0000	61.1J
72/11/09	10 45	0000	18.8J

J VALUE KNOWN TO BE WITHIN ERROR

STORET RETRIEVAL DATE 74/09/30

555408
44 05 00.0 088 32 00.0
WINNEBAGO LAKE
55039 WISCONSIN

11EPALES
6

2111202
0010 FEET DEPTH

DATE FROM TO	TIME OF DAY	DEPTH FEET	00010 WATER TEMP CENT	00300 DO MG/L	00077 TRANSP SECCHI INCHES	00094 CNDUCTVY FIELD MICROMHO	00400 PH SU	00410 T ALK CACO3 MG/L	00630 NO2&NO3 N-TOTAL MG/L	00610 NH3-N TOTAL MG/L	00665 PHOS-TOT MG/L P	00666 PHOS-DIS MG/L P
72/08/20	15 00	0000			20	260	8.65	132	0.100	0.140	0.101	0.037
	15 00	0004	23.6	7.0		270	8.55	125	0.090	0.120	0.084	0.039
	15 00	0008	23.5	6.1		275	8.60	126	0.070	0.130	0.092	0.033
72/11/09	11 45	0000			18	350	7.80	152	0.370	0.080	0.069	0.030
	11 45	0008	6.2	9.3		360	7.80	152	0.390	0.100	0.055	0.033

DATE FROM TO	TIME OF DAY	DEPTH FEET	32217 CHLRPHYL A UG/L
72/08/20	15 00	0000	23.6J
72/11/09	11 45	0000	22.3J

J VALUE KNOWN TO BE IN ERROR

STORET RETRIEVAL DATE 74/09/30

555409
44 15 00.0 088 30 00.0
WINNEBAGO LAKE
55039 WISCONSIN

11EPALES 2111202
6 0020 FEET DEPTH

DATE FROM TO	TIME OF DAY	DEPTH FEET	00010 WATER TEMP CENT	00300 DO MG/L	00077 TRANSP SECCHI INCHES	00094 CNDUCTVY FIELD MICROMHO	00400 PH SU	00410 T ALK CACO3 MG/L	00630 NO2&NO3 N-TOTAL MG/L	00610 NH3-N TOTAL MG/L	00665 PHOS-TOT MG/L P	00666 PHOS-DIS MG/L P
72/09/20	15	25 0000			44	283	8.90	131	0.090	0.080	0.091	0.057
	15	25 0004	22.1	9.7		280	8.90	131	0.070	0.060	0.090	0.054
	15	25 0015	21.4	6.3		290	8.62	132	0.080	0.070	0.163	0.107
72/11/09	11	25 0000			21	320	7.90	143	0.240	0.160	0.072	0.046
	11	25 0004	6.1	10.6		320	7.90	139	0.230	0.160	0.078	0.047
	11	25 0014	6.0	10.6		320	7.90	139	0.230	0.170	0.082	0.048

DATE FROM TO	TIME OF DAY	DEPTH FEET	32217 CHLRPHYL A UG/L
72/09/20	15	25 0000	7.4J
72/11/09	11	25 0000	25.0J

J VALUE KNOWN TO BE LESS THAN

APPENDIX C

TRIBUTARY and WASTEWATER TREATMENT PLANT DATA

STORET RETRIEVAL DATE 74/10/02

5554A1 L5554A1
44 12 00.0 088 27 30.0
NEENAH CHANNEL OF FOX RIVER
55 15 NEENAH
0/LAKE WINNEBAGO
ST HWY 114 BRDG TO DOTY IN NEENAH
11EPALES 2111204
4 0000 FEET DEPTH

DATE FROM TO	TIME OF DAY	DEPTH FEET	00630 NO3&NO3 N-TOTAL MG/L	00625 TOT KJEL N MG/L	00610 NH3-N TOTAL MG/L	00671 PHOS-DIS ORTHO MG/L P	00665 PHOS-TOT MG/L P
72/09/23	09	55	0.290	2.000	0.280	0.058	0.300
72/10/21	09	00	0.208	2.050	0.320	0.094	0.235
72/11/18	08	30	0.130	2.600	0.210	0.056	0.100
72/12/23	08	40	0.149	0.960	0.150	0.042	0.069
73/01/20	09	30	0.240	1.680	0.180	0.005K	0.200
73/02/24	09	30	0.336	0.930	0.012	0.019	0.055
73/03/24	09	45	0.440	1.500	0.088	0.019	0.195
73/04/07	09	15	0.315	1.470	0.030	0.007	0.060
73/04/21	08	30	0.480	1.500	0.010	0.024	0.155
73/05/05	09	30	0.100	0.820	0.006	0.012	0.045
73/05/19	09	00	0.042	1.760	0.027	0.024	0.130
73/06/23	10	00	0.231	1.800	0.126	0.064	0.090
73/07/21	09	40	0.042	3.900	0.105	0.029	0.115
73/08/25	08	30	0.072	1.600	0.034	0.048	0.230

K VALUE KNOWN TO BE LESS THAN INDICATED

STORET RETRIEVAL DATE 74/10/02

5554A2 LS5554A2
44 11 30.0 088 27 30.0
MENASHA CHANEL OF FOX RIVER
55 15 NEENAH
0/LAKE WINNEBAGO
ST HWY 114 BRDG DOTY ISLANDTO MANASHA
11EPALES 2111204
4 0000 FEET DEPTH

DATE FROM TO	TIME OF DAY	DEPTH FEET	00630 NO2&NO3 N-TOTAL MG/L	00625 TOT KJEL N MG/L	00610 NH3-N TOTAL MG/L	00671 PHOS-DIS ORTHO MG/L P	00665 PHOS-TOT MG/L P
72/09/23	09 15		0.322	2.000	0.325	0.[illegible]0	0.294
72/10/21	08 30		0.150	2.150	0.147	0.[illegible]8	0.270
72/11/18	08 50		0.110	1.200	0.115	0.046	0.084
72/12/23	09 10		0.176	1.000	0.147	0.038	0.066
73/01/20	09 45		0.231	1.150	0.147	0.039	0.055
73/02/24	10 00		0.320	0.880	0.009	0.014	0.060
73/03/24	10 15		0.253	1.680	0.068	0.009	0.250
73/04/07	09 45		0.400	1.150	0.021	0.009	0.070
73/04/21	08 30		0.480	1.260	0.021	0.026	0.155
73/05/05	10 00		0.090	0.840	0.007	0.012	0.045
73/05/19	08 30		0.078	1.540	0.086	0.023	0.105
73/06/23	09 30		0.200	1.150	0.105	0.066	0.095
73/07/21	09 30		0.025	2.100	0.071	0.042	0.190
73/08/25	09 30		0.048	1.620	0.020	0.105	0.230

STORET RETRIEVAL DATE 74/10/02

5554A3 LS5554A3
44 01 00.0 088 32 30.0
FOX RIVER
55 15 OSHKOSH
I/LAKE WINNEBAGO
ST HWY 175 BRDG IN OSHKOSH BELOW STP
11EPALES 2111204
4 0000 FEET DEPTH

DATE FROM TO	TIME OF DAY	DEPTH FEET	00630 NO2&NO3 N-TOTAL MG/L	00625 TOT KJEL N MG/L	00610 NH3-N TOTAL MG/L	00671 PHOS-DIS ORTHO MG/L P	00665 PHOS-TOT MG/L P
72/09/23	09 00		0.326	1.500	0.297	0.054	0.105
72/10/15	13 40		0.140	1.600	0.150	0.025	0.126
72/11/12	13 35		0.320	1.050	0.034	0.023	0.063
72/12/10	10 45		0.570	1.150	0.077	0.022	0.054
73/01/13	14 15		1.200	1.050	0.130	0.040	0.065
73/02/11	13 45		0.970	1.100	0.079	0.036	0.075
73/03/11	13 30		0.790		0.273	0.062	
73/04/01	08 30		0.290	0.960	0.019	0.007	0.060
73/04/14	14 30		0.147	0.860	0.010	0.011	0.057
73/05/06	08 00		0.062	1.150	0.040	0.017	0.065
73/05/20	13 15		0.015	1.260	0.020	0.018	0.075
73/06/26	11 30		0.032	1.500	0.048	0.034	0.105
73/07/14	13 15		0.010K	2.200	0.026	0.039	0.150
73/08/11	09 00		0.010K	2.500	0.056	0.038	0.195

K VALUE KNOWN TO BE LESS THAN INDICATED

35<

STORET RETRIEVAL DATE 74/10/02

5554A4 5508A1
44 02 00.0 088 34 00.0
FOX RIVER
55 15 OSHKOSH
I/LAKE WINNEBAGO
ST HWY 21 BRDG IN OSHKOSH ABOVE STP
11EPALES 2111204
4 0000 FEET DEPTH

DATE FROM TO	TIME OF DAY	DEPTH FEET	00630 NO2&NO3 N-TOTAL MG/L	00625 TOT KJEL N MG/L	00610 NH3-N TOTAL MG/L	00671 PHOS-DIS ORTHO MG/L P	00665 PHOS-TOT MG/L P
72/09/23	09 25		0.143	1.600	0.210	0.042	0.110
72/10/15	14 00		0.150	1.600	0.105	0.020	0.110
72/11/12	13 55		0.110	1.260	0.038	0.017	0.069
72/12/10	11 20		0.600	0.960	0.026	0.017	0.046
73/01/13	13 45		1.190	0.940	0.110	0.026	0.055
73/02/11	14 20		0.930	1.000	0.071	0.042	0.075
73/03/11	14 00		0.760	1.540	0.455	0.049	0.163
73/04/01	08 35		0.330	1.300	0.016	0.007	0.055
73/04/14	14 45		0.138	0.840	0.008	0.008	0.050
73/05/04	08 25		0.060	1.000	0.027	0.017	0.065
73/05/20	13 30		0.010K	1.490	0.023	0.013	0.065
73/06/26	11 10		0.011	1.500	0.190	0.027	0.100
73/07/14	13 30		0.010K	1.980	0.029	0.042	0.155
73/08/11	09 30		0.010K	2.520	0.017	0.037	0.200

K VALUE KNOWN TO BE LESS THAN INDICATED

STORET RETRIEVAL DATE 74/10/02

5554R1 LS5554R1
43 48 30.0 088 24 00.0
EAST OUTLET OF TAYCHEEDAH CREEK
55 15 FOND DU LAC
T/LAKE WINNEBAGO
US 151 BRDG AT TAXCHEEDAH
11EPALES 2111204
4 0000 FEET DEPTH

DATE FROM TO	TIME OF DAY	DEPTH FEET	00630 NO2&NO3 N-TOTAL MG/L	00625 TOT KJEL N MG/L	00610 NH3-N TOTAL MG/L	00671 PHOS-DIS ORTHO MG/L P	00665 PHOS-TOT MG/L P
72/09/23	16 20		0.160	1.500	0.210	0.048	0.252
72/10/01	15 40		0.610	1.700	0.105	0.140	0.250
72/11/04	14 15		1.400	1.540	0.105	0.093	0.210
72/12/02	10 50		4.750	0.920	0.063	0.086	0.132
73/01/07	08 55		5.500	1.050	0.126	0.120	0.160
73/02/11	10 30		6.200	0.390	0.045	0.048	0.115
73/03/03	14 15		2.000	4.100	1.300	0.395	0.610
73/04/07	11 15		3.100	1.050	0.020	0.042	0.090
73/04/23	14 15		1.200	1.500	0.005K	0.063	0.200
73/05/06	14 45		2.300	1.200	0.028	0.048	0.095
73/05/20	12 25		1.200	1.260	0.019	0.025	0.080
73/06/17	13 30		1.160	1.470	0.090	0.126	0.220
73/07/09	10 45		0.026	1.320	0.036	0.071	0.125
73/08/04	13 30		0.420	2.000	0.030	0.080	0.190

K VALUE KNOWN TO BE LESS THAN INDICATED

STORET RETRIEVAL DATE 74/10/02

555482 LS555482
43 48 00.0 082 25 30.0
WEST OUTLET OF TAYCHEEDAH CREEK
55 15 FOND DU LAC
T/LAKE WINNEBAGO
US 151 BRDG .75 MI NE FON DU LAC
11EPALES 2111204
4 0000 FEET DEPTH

DATE FROM TO	TIME OF DAY	DEPTH FEET	00630 NO2&NO3 N-TOTAL MG/L	00625 TOT KJEL N MG/L	00610 NH3-N TOTAL MG/L	00671 PHOS-DIS ORTHO MG/L P	00665 PHOS-TOT MG/L P
72/09/23	16 00		0.130	1.400	0.196	0.060	0.252
72/10/01	15 00		0.970	1.550	0.100	0.147	0.190
72/11/04	14 25		3.500	1.150	0.034	0.097	0.132
72/12/02	10 10		3.500	1.100	0.064	0.055	0.096
73/01/07	11 00		5.500	1.150	0.126	0.100	0.135
73/03/03	12 30		2.200	5.000	1.700	0.460	0.680
73/04/07	11 45		1.900	1.320	0.042	0.039	0.160
73/04/23	13 15		1.840	2.310	0.069	0.082	0.195
73/05/06	15 30		3.200	1.470	0.079	0.058	0.145
73/05/19	12 15		2.200	2.000	0.052	0.033	0.118
73/06/17	14 00		2.300	2.700	0.138	0.110	0.195
73/07/08	10 15		1.600	1.470	0.060	0.058	0.165
73/08/04	14 30		0.252	1.980	0.140	0.100	0.210

STORET RETRIEVAL DATE 74/10/02

5554C1 L55554C1
43 4A 00.0 JAA 24 00.0
DE NEVEU CREEK
55 15 FOND DU LAC
T/LAKE WINNEBAGO
US 151 BRDG NE EDGE OF FOND DU LAC
11EPALES 2111204
0000 FEET DEPTH

DATE FROM TO	TIME OF DAY	DEPTH FEET	00630 NO2&NO3 N-TOTAL MG/L	00625 TOT KJEL N MG/L	00610 NH3-N TOTAL MG/L	00671 PHOS-DIS ORTHO MG/L P	00665 PHOS-TOT MG/L P
72/09/23	16 00		0.180	1.250	0.112	0.056	0.300
72/10/01	14 30		0.700	1.050	0.075	0.148	0.268
72/11/04	15 45		1.920	1.200	0.075	0.124	0.180
72/12/02	09 30		3.100	1.150	0.031	0.082	0.140
73/01/07	10 20		2.100	1.300	0.160	0.066	0.115
73/02/11	10 20		3.100	1.050	0.132	0.072	0.125
73/03/03	15 00		1.660	3.900	1.260	0.310	0.510
73/04/07	10 30		1.600	0.730	0.010	0.063	0.110
73/04/23	13 45		1.420	1.200	0.013	0.086	0.150
73/05/06	14 00		1.620	3.100	0.110	0.054	0.095
73/05/19	12 07		1.540	1.380	0.030	0.026	0.055
73/06/17	13 00		1.840	1.600	0.058	0.137	0.208
73/07/08	10 30		0.620	0.980	0.044	0.056	0.120
73/08/04	13 15		0.710	2.100	0.105	0.072	0.135

STORET RETRIEVAL DATE 74/10/02

555401 LS555401
43 47 30.0 088 27 00.0
FOND DU LAC RIVER
55 15 FOND DU LAC
T/LAKE WINNEBAGO
US 45/SCOTT ST BRDG N EDGE FOND DU LAC
11EPALES 2111204
4 0000 FEET DEPTH

DATE FROM TO	TIME OF DAY	DEPTH FEET	00630 NO2&NO3 N-TOTAL MG/L	00625 TOT KJEL N MG/L	00610 NH3-N TOTAL MG/L	00671 PHOS-DIS ORTHO MG/L P	00665 PHOS-TOT MG/L P
72/09/23	16 00		0.151	1.450	0.210	0.030	0.336
72/10/01	15 00		0.890	1.400	0.140	0.147	0.220
72/11/04	14 30		1.440	1.760	0.072	0.110	0.168
72/12/02	10 00		1.040	1.400	0.046	0.042	0.090
73/01/07	11 10		5.500	0.920	0.092	0.115	0.150
73/02/11	10 00		0.980	1.320	0.069	0.054	0.090
73/03/03	13 30		2.100	4.000	1.500	0.370	0.610
73/04/07	10 45		1.060	1.000	0.037	0.039	0.085
73/04/23	13 30		0.840	1.680	0.056	0.097	0.200
73/05/06	14 30		0.755	1.400	0.032	0.077	0.125
73/05/19	12 43		0.430	1.400	0.026	0.110	0.150
73/06/17	14 15		1.380	3.400	0.190	0.480	0.600
73/07/08	10 00		1.660	1.350	0.082	0.198	0.250
73/08/04	14 15		1.500	2.725	0.100	0.023	0.110

STORET RETRIEVAL DATE 74/10/02

5554E1 LS5554E1
43 50 00.0 088 29 00.0
ANDERSON CREEK
55 15 FOND DU LAC
1/LAKE WINNEBAGO
CO RD .75 MI N OF FOND DU LAC
11EPALES 2111204
4 0000 FEET DEPTH

DATE FROM TO	TIME OF DAY	DEPTH FEET	00630 NO2&NO3 N-TOTAL MG/L	00625 TOT KJEL N MG/L	00610 NH3-N TOTAL MG/L	00671 PHOS-DIS ORTHO MG/L P	00665 PHOS-TOT MG/L P
72/09/23	15 30		0.265	1.200	0.205	0.030	0.390
72/10/01	15 00		0.420	1.300	0.130	0.260	0.320
72/11/04	15 15		0.630	1.540	0.081	0.168	0.252
72/12/02	11 00		1.060	1.680	0.198	0.066	0.110
73/01/07	09 55		1.680	1.400	0.168	0.126	0.190
73/02/10	14 30		0.780	1.150	0.168	0.160	0.200
73/03/03	11 30		2.000	5.300	2.000	0.440	0.560
73/04/07	11 30		0.420	0.960	0.040	0.058	0.090
73/04/23	14 00		0.360	2.000	0.037	0.138	0.200
73/05/06	14 15		0.480	2.460	0.080	0.140	0.220
73/05/19	13 11		0.019	2.200	0.026	0.058	0.115
73/06/17	13 15		0.028	1.600	0.063	0.084	0.155
73/07/08	11 00		0.070	1.800	0.113	0.088	0.220

STORET RETRIEVAL DATE 74/10/02

5554E2 LS5554E2
43 50 00.0 088 28 00.0
ANDERSON CREEK
55 15 FOND DU LAC
T/LAKE WINNEBAGO
CO RD .75 MI NE OF NORTH FOND DU LAC
11FPALES 2111204
4 0000 FEET DEPTH

DATE FROM TO	TIME OF DAY	DEPTH FEET	00630 NO2&NO3 N-TOTAL MG/L	00625 TOT KJEL N MG/L	00610 NH3-N TOTAL MG/L	00671 PHOS-DIS ORTHO MG/L P	00665 PHOS-TOT MG/L P
72/09/23	15 00		0.184	1.200	0.120	0.049	0.370
72/10/01	15 00		0.385	1.200	0.154	0.220	0.300
72/11/04	15 45		0.600	1.240	0.042	0.154	0.240
72/12/02	10 20		0.440	1.320	0.220	0.048	0.110
73/01/07	09 20		2.300	2.300	0.240	0.150	0.290
73/02/11	11 00		0.890	1.570	0.320	0.154	0.240
73/03/03	11 45		2.030	4.800	2.100	0.500	0.630
73/04/07	11 00		0.470	1.050	0.050	0.056	0.095
73/04/23	13 00		0.315	1.700	0.046	0.130	0.195
73/05/06	15 00		0.460	2.100	0.110	0.100	0.195
73/05/19	13 23		0.065	1.260	0.065	0.063	0.160
73/06/17	13 45		0.039	1.380	0.027	0.126	0.270
73/07/08	11 30		0.019	1.600	0.035	0.110	0.280
73/08/04	13 45		0.015	2.600	0.066	0.080	0.220

STORET RETRIEVAL DATE 74/09/30

555450 TF555450 P0355I5
43 48 00.0 088 26 30.0
CITY OF FOND DU LAC
55039 15 FOND DU LAC
0/LAKE WINNEBAGO
LAKE WINNEBAGO
11EPALES 2141204
4 0000 FEET DEPTH

DATE FROM TO	TIME OF DAY	DEPTH FEET	00630 N02&N03 N-TOTAL MG/L	00625 TOT KJEL N MG/L	00610 NH3-N TOTAL MG/L	00671 PHOS-DIS ORTHO MG/L P	00665 PHOS-TOT MG/L P	50051 FLOW RATE INST MGD	50053 CONDUIT FLOW-MGD MONTHLY
73/01/31	00	00							
CP(T)-			0.500	45.000	27.000	3.900	4.700	7.100	7.380
73/02/01	24	00							
73/02/28	00	00							
CP(T)-			0.875	56.000	35.000	4.400	6.500	6.620	6.550
73/03/31	24	00							
73/03/30	00	00							
CP(T)-			1.035	41.000	22.500	3.700	5.500	8.270	8.930
73/04/30	24	00							
73/04/30	00	00							
CP(T)-			0.050	31.000	12.000	4.100	6.300	8.380	9.220
73/05/31	24	00							
73/05/31	00	00							
CP(T)-			0.046	27.300	10.610	3.820	5.900	9.600	10.400
73/06/30	24	00							
73/06/30	00	00							
CP(T)-			0.010	18.700	10.800	7.90(	11.500	5.420	6.840
73/07/31	24	00							
73/07/31	00	00							
CP(T)-			0.029	54.000	31.960	4.700	7.950	6.080	5.320
73/08/31	24	00							
73/08/31	00	00							
CP(T)-			0.028	47.000		5.900	7.100	6.320	5.890
73/09/30	24	00							
73/10/02	00	00							
CP(T)-			0.050	43.000	18.000	0.510	5.000	6.360	5.610
73/10/02	24	00							
73/10/31	00	00							
CP(T)-			0.050	49.000	31.000	0.345	5.400	7.300	6.280
73/10/31	24	00							
73/11/30	00	00							
CP(T)-			0.010<	49.000	25.200	0.410	6.000	6.070	5.680
73/11/30	24	00							
73/12/31	00	00							
CP(T)-			0.200	25.000	12.600	0.280	1.400	4.770	5.840
73/12/31	24	00							

< VALUE KNOWN TO BE LESS THAN INDICATED

STORET RETRIEVAL DATE 74/04/30

555450 TF555450 P035515
43 48 00.0 088 26 30.0
CITY OF FOND DU LAC
55039 15 FOND DU LAC
0/LAKE WINNEBAGO
LAKE WINNEBAGO
11EPALES 2141204
4 0000 FEET DEPTH

DATE FROM TO	TIME OF DAY	DEPTH FEET	00631 NO3&NO2 I-TOTAL MG/L	00625 TOT KJEL N MG/L	00610 NH3-N TOTAL MG/L	00671 PHOS-DIS ORTHO MG/L P	00665 PHOS-TOT MG/L P	50051 FLOW RATE INST MGD	50053 CONDUIT FLOW-MGD MONTHLY
74/01/31	00 00								
CP(T)-									
74/01/31	24 00			28.000		0.140	2.500	8.750	6.210

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STORET RETRIEVAL DATE 74/09/30

355451 1355451 R3042M5
43 30 00.0 088 25 30.0
CITY OF W FORD DD LAC
55 15 FORD DD LAC
17LAKE 21143M6D
ANDERSON CREEK
LIMNALES
5
2141204
0000 FEET DEPTH

DATE FROM TO	TIME OF DAY	DEPTH FEET	00630 NO2&NO3 N-TOTAL MG/L	00625 TOT KJEL N MG/L	00610 NH3-N TOTAL MG/L	00671 PHOS-DIS ORTHO MG/L P	35655 PHOS-TOT MG/L P	50050 FLOW RATE INST MGD	50053 CONDUIT FLOW-MGD MONTHLY
73/01/03 09 00 CP(T)- 73/01/03 16 30			1.020	12.800	0.044	1.790	4.850	0.728	0.450
73/02/05 09 00 CP(T)- 73/02/05 16 30			0.525	17.600	1.900	0.760	7.100	0.572	0.612
73/03/05 09 00 CP(T)- 73/03/05 16 30			1.200	12.000	0.185	0.250	6.200	0.854	0.530
73/05/08 09 00 CP(T)- 73/05/08 16 30			0.910	9.200	0.064	0.480	2.400	0.856	0.750
73/06/12 09 00 CP(T)- 73/06/12 16 30			0.210	21.000	5.200	2.400	5.230	0.557	0.767
73/07/18 09 00 CP(T)- 73/07/18 16 00			0.130	25.200	8.300	0.350	4.100	0.457	0.575
73/08/01 08 30 CP(T)- 73/08/01 16 30			0.250	18.000	4.400	1.100	4.580	0.468	0.506
73/09/21 09 00 CP(T)- 73/09/21 16 00			0.120	19.000	8.600	3.200	6.800	0.497	0.575
73/10/09 09 00 CP(T)- 73/10/09 16 00			0.290	22.000	9.700	4.100	6.300	0.576	0.713
73/11/09 09 00 CP(T)- 73/11/09 16 00			0.260	20.000	6.800	0.910	3.200	0.504	0.550
73/12/11 09 00 CP(T)- 73/12/11 16 30			1.200	23.000	3.800	1.890	4.600	0.438	0.630
74/02/07 09 00 CP(T)- 74/02/07 16 00			0.640	15.000	1.800	0.650	3.750	0.575	0.580

STORET RETRIEVAL DATE 74/09/30

555452 PR555452 P053221
44 01 00.0 088 33 30.0
CITY OF OSHKOSH
55 15 OSHKOSH
T/LAKE WINNEBAGO
FOX RIVER
TIEPALES 2141204
4 0000 FEET DEPTH

DATE FROM TO	TIME OF DAY	DEPTH FEET	00630 NO2&NO3 N-TOTAL MG/L	00625 TOT KJEL N MG/L	00610 NH3-N TOTAL MG/L	00671 PHOS-DIS ORTHO MG/L P	00665 PHOS-TOT MG/L P	50051 FLOW RATE INST MGD	50053 CONDUIT FLOW-MGD MONTHLY
72/12/28	08 00		0.042	11.880	3.900	2.300			
73/01/29	08 00		1.050	15.000	0.910	2.000	5.700	8.050	9.120
73/02/27	08 00		0.490	19.000	5.700	0.155	2.000	11.400	11.200
73/03/27	08 30		1.050	9.600	0.079		2.050	10.000	10.300
73/04/24	08 00		1.640	9.620	0.075	0.127	2.100	15.900	15.700
73/05/30	08 00		2.640	6.800	0.049	0.850	2.300	14.400	14.400
73/06/26	08 00		0.290	13.200	1.600	0.400	2.990	16.100	16.100
73/07/26	08 00		0.220	11.500	1.260	0.060	1.450	11.500	12.600
73/08/28	08 30			16.000		0.340	2.700	10.500	9.650
73/09/26	08 00		0.050	14.700	4.000	2.300	3.100	10.200	9.400
73/10/25	08 30		0.037	21.000	7.200	0.330	2.300	9.330	8.760
73/11/29	08 00		1.260	19.000	0.084	0.570	3.200	8.440	8.910
73/12/31	08 00		0.320	20.000	4.700	0.220	1.400	9.540	8.710
								7.370	8.750